York University
Lassonde School of Engineering

LE/ESSE 2620 3.0

Fundamentals of Surveying

Fall 2016

Course Director

Jian-Guo Wang, Dr.-Ing., P.Eng.
Phone: (416) 736-2100 ext. 20761 *Fax:* 416-650-8135
E-mail: jgwang@yorku.ca
Office: PSE 245

Teaching Assistants

Julien Lee-Chee-Ming
Email: julienli@yorku.ca
Sowyma Natesan
Email: sowmy@yorku.ca
Thomas MacDougall
Email: macdout@yorku.ca
Patrick Lasagna
Email:
Zhongyao Lin
Email: zy2lin@yorku.ca

Lectures

Tuesdays, 14:30 – 16:30 (2:30pm – 4:30pm)
Room: LSB105

Office Hours

Thursdays, 14:00 – 16:00 or per appointment

Laboratory exercises

Session 1: Tuesdays, 11:30 – 14:30 (5 groups)
Session 2: Thursdays, 11:30 – 14:30 (5 groups)
Session 3: *Fridays*, 11:30-14:30 (5 groups)
Session 4: *Fridays*, 11:30-14:30 (4 groups)
Room: PSE 020 (instrument check-in and check-out)

Assessment

Lab Assignments	40%
Mid-term test	15%
Participation	5%
Final Exam	40%

Attention: 1). Any student, who misses maximum three (3) lab sessions for any reason, will automatically prevent from passing this course without exception.

2). The weight of the missed mid-term exam will be shifted to the final exam if you have an officaly valid excuse such as a medical doctor's note.

Grade System

≥90%	A+
80-89%	A
75-79%	B+
70-74%	B
65-69%	C+
60-64%	C
55-59%	D+
50-54%	D
40-49%	E
<39%	F

Final marks from weighted averages will be converted to letter grades according to the University's regulations

GENERAL COURSE INFORMATION

1. Course Learning Outcomes

- Develop knowledge and understanding of the fundamental concepts of surveying and mapping.
- Develop knowledge, understanding and capability of handling, taking care and testing of survey equipment both in laboratory and field environments.
- Deveolp knowledge, understanding, and skills in measurement collection, processing, and analysis via calculations, computer programming and technical drawing.
- Develop knowledge and understanding of surveying methods, techniques, measurement errors and accuracies, and to apply them in practice
- Gain field and office experience, and develop practical skills on use of surveying instruments and on key survey operations (e.g.. topgraphic mapping, ordinary leveling, basic control surveys, route surveying).
- Extend and apply fundamnetal surevying knowledge to specifc surveying applications.

2. Format

Since every individual responds to different stimuli in his or her learning process, the presentation of the material will be done in a variety of ways. All of them will require work on your part to be effective. We will take a participative approach to learning. This means that faculty and students learn **together** by doing. We will learn **with** each other and **from** each other. **Therefore, we are all responsible for being prepared for class:**

- Lectures will be conducted in form of teaching, discussion and participation. Students are required to participate actively, and design and solve problems by synthesizing knowledge, experience and skills from previous courses.
- Each session will normally commence with a brief review of the concepts treated previously. New subject(s) will be presented immediately after the review, according to the tentative lecture schedule provided in this handout. **Participation** is an essential element of learning: It will be **encouraged** and **assessed**.

- Examples and instrument demos will always be given to understand the concepts.
- All sessions will based on, but not limited to the textbook. Additional materials may also be supplied by the instructor for further studies upon the potential needs. The students will be required to actively search relevant literature to further their knowledge.
- Students may be required to visit selected industrial companies in Geomatics Engineering. The appointments will be arranged separately.

3. Laboratory Assignemnts and Exercises

- Laboratory assignments are most essential for the development of skills and experience. They will comprise a variety of activities that are usually required in the design, planning, execution, analysis and interpretation of data, and preparation of comprehensive reports.
- Laboratory exercises will be conducted in the lab or outside infield.
- Laboratory reports will have clear due dates. You are expected to describe your labs against the lab's objectives in details, and to summarize the results in reports.
- Participation in all laboratory exercises is **mandatory**.
- Grades for late laboratory reports will be decreased by 20% per day for each day overdue. Late lab reports must be handed in personally to your TA or INSTRUCTOR

4. Getting feedback on your progress

Feedback on your progress will be provided in four different ways:

- Each class session should give you a fair idea how well you have understood the relevant material.
- Laboratory exercises: You will be asked to execute mandatory laboratory assignments, to solve specific problems and to write reports. Your participation is essential and will be assessed.
- Mid-term test.
- Final exam.

5. Announcements

Announcements and information related to the course, such as special lectures, class cancellations, change of due dates, professional activities, Internet links, and others will be emailed to the students or announced in class. Please check regularly for up-to-date announcements and information.

ACADEMIC INTEGRITY

All students should take the time to acquaint themselves with the university's policy concerning academic integrity in courses. Cheating, plagiarsing amd making unauthorized multiple submissions of academic assignments are not allowed. You are all advised to read about this at http:/www.yorku.ca/academicintegrity ('For students' session), and to complete the Academic integrity tutorial at http:/www.yourku.ca/tutorial/academic integrity/. You should print the results page of your successful quiz and keep it for verification if asked.

Ethical behaviour must be observed at all times.

SAFETY IN LAB AND FIELD

No Job is so important and no service so urgent that we cannot take time to perform our work safety. The following is not intended to be an all-inclusive capsule of safety requirements.

- Students comply with all safety regulations, policies of Lassonde School of Engineering and York University at large.
- Wear personal protective equipment (e.g., the safety vests, helmets, appropriate shoes and clothes) in all designated areas or when otherwise directed to do so.
- Immediately report to TA or course Director if any safety incident occurs or may occur.
- Each individual in lab or in field has the responsibility and obligation to the other group members to work safely. If one sees another one perform an unsafe act, they should call this to the other person's attention, whether the unsafe act affects only the individual or the whole team.
- The equipment used has the potential to become very hazardous objects and must be properly secured for travel.
- The survey instruments used should be protected from any potential damage.

COURSE OUTLINE

1. Surveying and mapping.
2. Field and office work.
3. Concepts of error analysis.
4. Distance measurements.
5. Levelling.
6. Angle and direction measurements.
7. GNSS relative baseline measurements.
8. Survey operations.
9. Basic control surveys.
10. Topographical Mapping, control and topographic surveys.
11. Route surveying.
12. Construction surveying.

TEXT BOOKS

Anderson, MJ., and E.M. Mikhail (2012): Surveying – Theory and practice. McGraw-Hill, (7th edition), 2012. **Required**.

Wang, Jian-Guo (2016): Fundamentals of Surveying, Lecture slides, Geomatics Engineering, York University, 2016.

SUGGESTED REFERENCES

Ghilani, C.D. and Paul R. Wolf (2014): Elementary Surveying - An Introduction to Geomatics, Prentice Hall, New Jersey, 14th Edition, 2014.

Kavanagh, Barry F. (2013): Surveying with Construction Applications, 8th Edition, Prentice Hall, 2013.

Schofield, W. and Breach, Mark (2007): Engineering Surveying, 6th Edition, CRC Press, New York, 2007.

Leick, A, (2015): GPS Satellite Surveying. John Wiley, New York, 4nd Edition, 2015.

Ghilani, C.D. and Wolf, P.R. (2010), Adjustment Computations: - Spatial Data Analysis, John Wiley & Sons (5th edition), 2010.

Cole, G.M. and Harbin, A.L.(2014): Surveyor Reference Manual, 6th Edition, Professional Publications, INC, 2014.

TENTATIVE CLASS & LABORATORY ASSIGNMENTS SCHEDULE

Fall Class Start: Thursday, September 08, 2016
Fall Class End: Monday, December 05, 2016
Reading Days: Oct. 27 – 30, 2016

Statutory Holiday(s): Thanksgiving Day, Monday, Oct. 10, 2016

Fall Exams Start: December 7, 2016
Fall Exams End: December 22, 2016

Date ***Subject***

Week 1: Tuesday, September 13, 2016
Lecture: Introduction – Course Outline and Requirements
Surveying and Mapping (Chapter 1[*]); field and office work (Chapter 3); Basics of error theory and error propagation.
Labotatory and Filed work (lab #1): taping: instruments and techniques
[*] ***the chapter in the required textbook***

Week 2: Tuesday, September 20, 2016
Lecture: Distance Measurements (Chapter 4): tapping, equipment for tapping, taping on level & slope ground, error analysis in tapping; stadia method; electromagnetic distance measurement;
Labotatory and Filed work (lab #2): leveling: equipment, tecniques, field observation and office data processing

Week 3: Tuesday, September 27, 2016
Lecture: Leveling: definitions, methods, instruments; principle of barometric leveling; trigonometric leveling; geodetic leveling, instruments, methods, error analysis, instrument care. (Chapter 5)
Labotatory and Filed work (lab #3): Theodolite and Horizontal/Vertical angle Observastions

Week 4: Tuesday, October 04, 2016
Lecture: Angle and direction measurements: bearings, azimuths, megnetic compass; error analysis; theodelites; methods of measurement, errors, accuracies, testing, adjustment, calibration; instrument care. (Chapter 6)
Labotatory and Filed work (lab #4): Operation of GPS receivers, Trimble Planning Utility and GPS positioning.

Week 5: Tuesday, October 11, 2016
Lecture: Introduction to GNSS, GPS singals, measurements and error budget, GPS positioning modes, GPS post data processing; Combined distance and angular measurements: Total station instruments, instrument use, instrument care, analysis of error sources (Chapter 7).
Labotatory and Filed work (lab #5): Operation of total stations, Intersection and Resection.

Week 6: Tuesday, October 18, 2016
Lecture: ***Mid-Term test*** (90min); Control surveys: introduction to triangulation,

trilateration and combined networks, other methods of horizontal poistioing: intersection, resection and their calculation, erorr and accuracies (Chapter 9)

Labotatory and Filed work (lab #6): Control Surveys – Traversing Data Processing.

Week 7: Tuesday, October 25, 2015

Lecture: Control surveys (cont'd): other methods of horizontal poistioing (cont'd); Traversing: introduction, types of trverses, field procedures, error analysis of the traverse, adjustment of the traveres, methods of determining area. (Chapter 8)

Reading Days (Oct. 27 ~ 30)

Week 8: Tuesday, November 01, 2016

Lecture: Topographical mapping: concepts, reference systems, datums; representation of relief, map symbols and drawing, digital terrain models (Chapter 14).

Labotatory and Filed work (lab #7): Topographic mapping: lab exercise and drawing.

Week 9: Tuesday, November 08, 2016

Lecture: Control and topo surveys: concepts, planning and establishing geodetic control; horizontal and vertical control surveys; topographic surveys (Chpater 15).

Labotatory and Filed work (lab #8): Topographic Surveys: field exercise and drawing.

Week 10: Tuesday, November 15, 2016

Lecture: Route Surveys: route curves; circular curves, circular curve calculation and laying out; compund curves; spirals, spiral curve calculation and laying out; vertical curves; earthwork operations (Chapter 16).

Labotatory and Filed work (lab #9): Route Surveying: route layout: plan, control surveys and calculation (part 1: **Preparation of the road staking-out data)**.

Week 11: Tuesday, November 22, 2016

Lecture: Route Surveys (cont'd); introduction to land surveys; Construction surveys: general; specialized equipment; horizontal and vertical control; layout; As-built surveys; monotoring surveys; error sources (Chapter 17).

Labotatory and Filed work (lab #9): Route Surveying: route layout: plan, control surveys and calculation (part 1 cont'd and part 2: Road staking out in field**)**.

Week 12: Tuesday, November 29, 2016

Lecture: Construction surveys (cont'd); supplemetory topics/Course review.

Labotatory and Filed work (lab #9, cont'd).